ELECTRICAL CONNECTOR FOR A SMALL ELECTRIC MOTOR

FIELD OF THE INVENTION

The present invention relates to small electric motors and connectors therefore. In particular, the present invention relates to small electric motors and gear train assemblies housed in moulded plastic and connectors therefore.

BACKGROUND TO THE INVENTION

Small electric motors are used in a wide variety of applications. For instance, small DC electric motors are used in toys, power tools and motor vehicles. In many high volume applications, moulded plastic or die cast metal parts are used to house small electric motors and associated gear trains. In such applications, the moulded plastic or die cast metal components are usually designed to allow the motor some freedom of movement with respect to its housing. This is done so that the bearings within the motor and elsewhere in the drive train are not excessively loaded due to a lack of precision in the manufacture of such high volume components. Put another way, with moulded plastics it is difficult to achieve the manufacturing tolerances normally required for gear trains and their bearings and therefore a common design solution is to allow the motor to be free to move to a small extent in relation to its housing. A problem with this design approach arises in relation to the electrical connection to the motor.

One example of a small electric motor and gear train assembly can be found in automotive side or "wing" mirror assemblies. Electric motors are used to adjust the angle of the rear vision mirror with respect to the driver and are also used to park the mirror head with respect to the vehicle. In larger vehicle side mirrors, power telescoping mechanisms may be employed in which a small DC electric motor is used to drive a mirror head out from the side of the vehicle. In all of these applications, small DC electric motors are typically employed that have two slots for receiving electrical connectors. These "female" connector terminals on the motors

themselves provide for easy assembly. For instance, "male" terminals can be arranged to protrude from a housing for supporting the motor so that when a motor is installed into the housing, the male connectors protrude into the female connector slots to provide electrical connection to the motor. A problem with this approach is that small movements of the motor in use (relative to its surrounding housing) can lead to fretting of the electrical connection and/or back out of the connector from the motor.

It is an object of the present invention to provide an improved connector to a small electric motor.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided a small electric motor and motor housing assembly comprising:

a small electric motor body having a pair of spaced apart sockets for receiving and frictionally engaging spaced apart parallel electrical power supply terminals;

a housing supporting the motor, the housing defining an aperture over the sockets;

a connector body;

a pair of spaced apart parallel electrical terminals extending outwards from the connector body and receivable by the sockets;

a motor body gripping portion extending from the connector body, the gripping portion mechanically latched to the motor body thereby substantially preventing relative movement between the terminals and the sockets; and

a pliable member mounted between the connector body and the housing, the pliable member allowing relative movement between the connector body and the housing while the motor moves relative to the housing under varying loads.

Preferably the assembly further comprises a sealing member between the connector body and the housing.

Preferably the sealing member is the pliable member.

Preferably the motor body further comprises an end bell and the gripping portion further comprises a pair of arms extending from the connector body, the arms resiliently displaceable away from each other to snap fit around the end bell thereby mechanically latching the connector body to the motor body.

Preferably the terminals are insert moulded.

According to a second aspect of the invention there is provided a connector for a small electric motor, the motor having a motor body with a pair of spaced apart sockets for receiving and frictionally engaging spaced apart parallel electrical power supply terminals, the connector comprising:

a connector body;

a pair of spaced apart parallel electrical terminals extending outwards from the connector body and receivable by the sockets; and

a motor body gripping portion extending from the connector body,

wherein the gripping portion mechanically latches to the motor body thereby substantially preventing relative movement between the terminals and the sockets.

Preferably the motor body further comprises an end bell and the gripping portion further comprises a pair of arms extending from the connector body, the arms resiliently displaceable away from each other to snap fit around the end bell thereby mechanically latching the connector body to the motor body.

Preferably the terminals are insert moulded.

Specific embodiments of the invention will now be described in some further detail with reference to and as illustrated in the accompanying figures. These embodiments are illustrative, and are not meant to be restrictive to the scope of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Preferred embodiments of the invention are illustrated in the accompanying representations in which:

Figure 1 shows a exploded perspective view of a small electric motor and motor housing assembly according to the invention.

Figure 2 shows a top perspective view of the assembly of Figure 1.

Figure 3 is a front cut away perspective view of the assembly of Figure 1 and 2.

Figure 4a is a sectional view taken through section lines 4-4 illustrated in Figure 3.

Figure 4b is a similar view to that of Figure 4a but with the motor not installed.

Figure 5 is a perspective view of the connector shown in Figure 1.

Figure 6 is a perspective view of a general arrangement of an external rear view mirror assembly containing a small motor and a motor housing of the type showing in Figure 1.

Figure 7a and 7b are exploded perspective views of the mirror assembly of Figure 6.

Figure 8 is a cross-sectional view of the assembly shown in Figure 7b.

Referring to Figure 1 a small electric motor and housing assembly is shown. The assembly includes a small electric motor 60 a moulded plastic housing 69 housing and supporting the motor 60 and a connector 80. The small electric motor has a body with a pair of spaced apart sockets 70 for receiving and frictionally engaging spaced apart parallel electrical power supply terminals 85 and 86 most clearly shown in Figure 5. The motor body 60′ has an end bell 72 and an output shaft 78.

Now referring to Figure 5 and Figure 1, the connector 80 has a connector body 81, a pair of spaced apart parallel electrical terminals 85 and 86 extending outwards from

the connector body 81 and receivable by the sockets 70 of the motor 60. The connector 80 also has a motor body gripping portion in form of a pair of arms 82 and 84 that extend from a connector body 81. The arms 82 and 84 are resiliently displaceable away from each other to snap fit around the end bell 72 of the motor 60 to thereby mechanically latch the connector body 81 to the motor body 60'.

The connector 80 includes a pliable member 88 which is mounted between the connector body 81 and the housing 69, pliable member 88 allowing relative movement between the connector body 81 and the housing 69 while the motor 60 moves relative to the housing 69 under varying loads. By having the connector 80 securely latched to the motor 60 such that the two parts move together eliminates or greatly reduces any tendency for fretting to occur in the electrical connection between the terminals 85 and 86 and their respective sockets 70 on the motor 60.

Again, referring to Figures 1 and 5, it can be seen that the terminals 85 and 86 are insert moulded into the connector body 81. Wires 89 protrude from the connector body 81 for electrical connection into the wiring harness of the vehicle (for instance through a plug).

The above described connector will have many applications. The housing 69 shown in Figure 1 is designed to accommodate a gear train driven by motor 60. The gear train drives a motor vehicle external mirror head around a substantially vertical axis from an in use to a folded position.

Referring to Figures 2, 3, 4a and 4b it can be seen that the motor 60 is held in place at one end at its end bell 72 and at its other end at its shaft 78 by surfaces 104 and 108 on the housing 69 on the one hand and by surfaces 106 and 110 on the base 68 on the other hand. The dimensions of the components are such that there is a small degree of float at the end of 78 and the end of the shaft 78 between the surfaces 104, 106, 108 and 110 respectively such that the motor 60 can move to allow correct meshing of the

worm gear 62 with gear 64 (shown in Figure 8) without producing excessive loads on the bearings of the gear shafts.

Assembly of the motor 60, housing 69 and connector 80 will now be described with reference to Figures 4a, 4b and Figure 1. The motor 60 is placed within the housing 69 such that the aperture 67 is positioned over the sockets 70. The resilient arms 82 and 84 and terminals 85 and 86 are then pressed through the aperture 67 such that the arms 82 and 84 snap fit around the end bell 72 of the motor at the same time as the terminals 85 and 86 enter and frictionally engage the socket 70 of the motor 60 as is shown in Figure 4a.

The above described connector and small electric motor housing assembly will have many applications. An application is illustrated in Figures 6, 7a, 7b and 8. In this application, the motor drives a gear train that extends and retracts a mirror head 15 from a bracket 12 to the side of a vehicle as shown in Figure 6. While the motor housing 69 is shaped somewhat differently to the motor housing 69 illustrated in Figures 1 to 4b, the operation of the connector and its interaction with the housing 69 is the same.

Many other embodiments of the invention are possible for applications including toys, power tools and other automotive assemblies outside of vehicle mirror applications.

In the embodiments described above, the housing for the motor is moulded plastic. In other embodiments of the invention die cast metal housings may be employed.

While the present invention has been described in terms of preferred embodiments in order to facilitate better understanding of the invention, it should be appreciated that various modifications can be made without departing from the principles in the

invention. Therefore, the invention should be understood to include all such modifications within the scope.